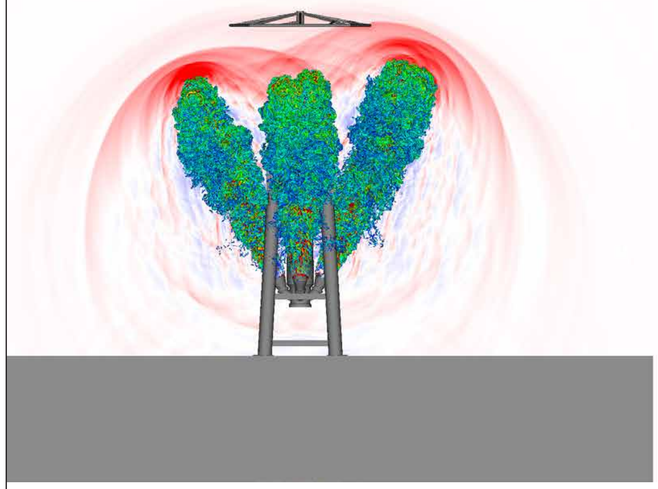
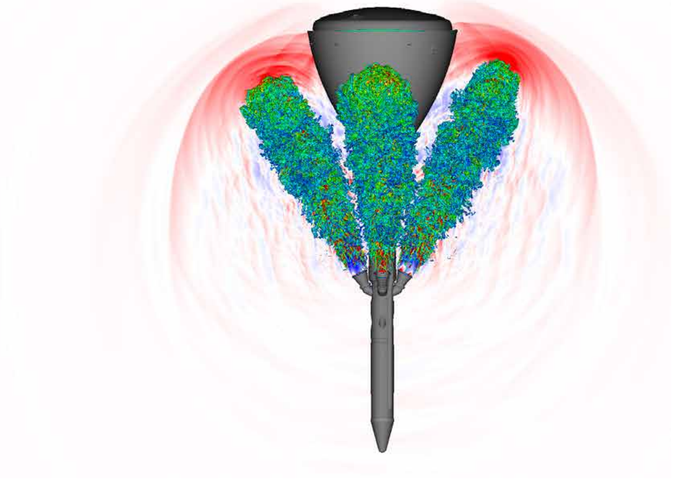
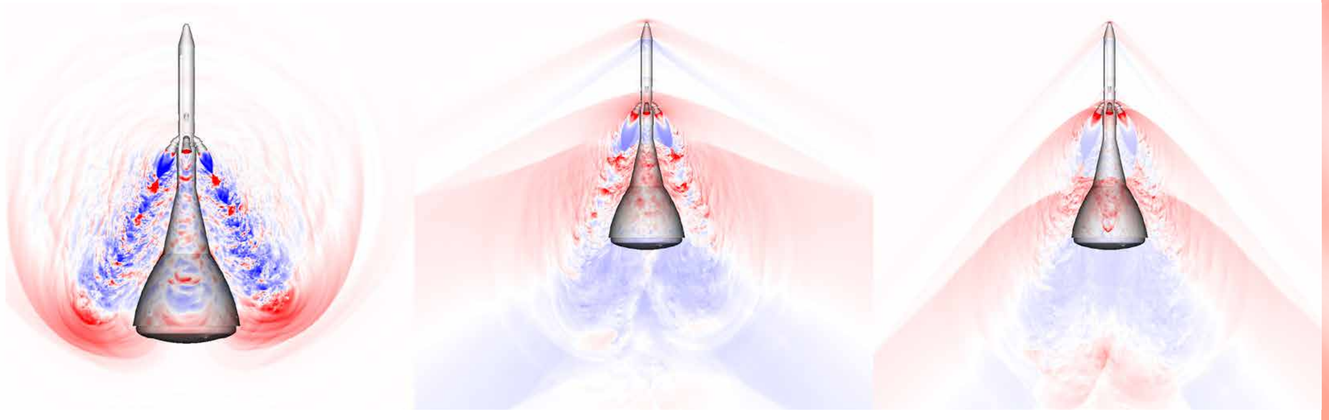




Snapshots from simulations of the QM-1 launch abort motor test (left), and the LAV pad abort scenario (right), at about 0.08 seconds after ignition of the abort motors. The QM-1 test and the LAV are shown in grey. Isosurfaces of the Q-Criterion, colored by Mach number, highlight turbulent structures. Gauge pressure is shown on the vertical half-plane and on the surface of the Orion spacecraft, delineating the ignition overpressure waves and the acoustic waves emanating from the jet mixing layer. *Francois Cadieux, Michael Barad, NASA/Ames*



Snapshots from simulations of pad abort (left), transonic launch abort (middle), and supersonic launch abort (right) at about 0.051 seconds after ignition of the launch abort motors. Gauge pressure is shown on the vertical half-plane and on the surface of the LAV, delineating the shock waves as well as the ignition overpressure waves and the acoustic waves emanating from the jet mixing layer. *Francois Cadieux, Michael Barad, NASA/Ames*

National Aeronautics and
Space Administration

Keeping Astronauts Safe: Predicting Vibrations on the Launch Abort Vehicle

As part of the critical work to protect astronauts during launch, we produced turbulence-resolving simulations of the Orion spacecraft for three launch abort scenarios to investigate the transient and vibrational loads on the Launch Abort Vehicle (LAV). We used cutting-edge technology to locally adapt the mesh resolution to the flow. Parallelized across 2,240 computer cores, the simulations advanced one microsecond at a time until 0.3 seconds after ignition, and were completed in about 50 days. Simulations of the launch abort motor test (QM-1), conducted last June, were performed in advance to ensure the test would proceed safely and to minimize risk associated with data collection. The predicted transient and acoustic loads closely matched the measured loads.

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